Claims

1. An optical frequency modulated transmitter comprising:

(a) a plurality of slave lasers, each of the slave lasers having an output, the outputs of the plurality of slave lasers being combined to form a single output beam of the optical frequency modulated transmitter, the lasers of the plurality of lasers being separately phased-controlled; and

(b) a master optical oscillator which outputs an optical signal for injection locking said plurality of slave lasers, the optical signal outputted by the master oscillator being frequency modulated directly in the master optical oscillator or externally thereof.

2. The transmitter of claim 1, wherein optical signal outputted by the master oscillator is modulated in an external modulator.

3. The transmitter of claim 1, wherein the master oscillator is modulated in response to an application of a modulation current or voltage thereto to thereby modulate the outputted optical signal.

4. The transmitter of claim 3, at least one optical isolator disposed between said master oscillator and said plurality of slave lasers to prevent unwanted injection of laser light back into the master oscillator from the slave lasers.

5. The transmitter of claim 4, wherein the master oscillator and the plurality of slave lasers are each optical devices which output light of a single carrier frequency.

6. The transmitter of claim 5, wherein the master oscillator and the plurality of slave lasers are provided by distributed feedback lasers.

7. The transmitter of claim 1 wherein a bias current or voltage is applied to each slave laser for adjusting the phase thereof relative to other slave lasers in said plurality of slave

lasers.

8. The transmitter of claim 1 further including a plurality of phase shifters, each phase shifter of said plurality of phase shifter being associated with and coupled upstream of one slave laser of said plurality of slave lasers for adjusting the phase thereof relative to other slave lasers in said plurality of slave lasers.

9. The transmitter of claim 8 further including a plurality of power oscillators arranged in a cascade arrangement upstream of the plurality of phase shifters and the plurality of slave lasers and wherein the plurality of phase shifters and the plurality of slave lasers are arranged in a plurality of groups thereof, each group of slave lasers being injection locked to a separate one of the power oscillators of the plurality of power oscillators.

10. The transmitter of claim 1 further including a plurality of power oscillators arranged in a cascade arrangement upstream of the plurality of slave lasers and wherein the plurality of slave lasers are arranged in a plurality of groups thereof, each group of slave lasers being injection locked to a separate one of the power oscillators of the plurality of power oscillators.

11. The transmitter of claim 1 wherein the slave lasers in addition to being injection locked to the master oscillator, are each arranged in a phase locked loop.

12. The transmitter of claim 11 wherein the phase locked loop associated with each slave laser comprises a differential photodetector coupled to an input and an output of its associated slave laser, the differential photodetector having an electrical output coupled to an electrical feedback path coupled to the associated slave laser.

13. The transmitter of claim 1 wherein each phase locked loop includes an electrical loop filter in the electrical feedback path.

14. A method of frequency modulating an optical beam comprising the steps of;

providing a plurality of slave lasers, each of the slave lasers having an output, the outputs of the plurality of slave lasers being combined to form the optical beam,

injection locking the plurality of slave lasers to an optical output of a master oscillator;

frequency modulating the optical output of the master oscillator before the optical output thereof is applied to the plurality of lasers; and

individually phase controlling the slave lasers of the plurality of slave lasers.

15. The method of claim 14 wherein the step of individually phase controlling the slave lasers in the plurality of slave lasers is performed in order to steer the optical beam.

16. The method of claim 14 wherein the step of individually phase controlling the slave lasers in the plurality of slave lasers is performed in order to achieve wavefront coherence of the optical beam.

17. The method of claim 14 wherein the step of individually phase controlling the slave lasers in the plurality of slave lasers is performed by a phase shifter arranged in series between each slave laser in the plurality of slave lasers and the master oscillator.

18. The method of claim 14 wherein the step of individually phase controlling the slave lasers in the plurality of slave lasers is performed by adjusting a current or voltage applied to each of the slave lasers in the plurality of slave lasers.

19. The method of claim 14 further including the step of arranging the plurality of slave lasers in groups and providing a power oscillator for each group arranged in series between the slave laser and the master oscillator whereby the master oscillator injection locks the power oscillator for each group directly and each slave laser indirectly via one of power oscillators.

20. The method of claim 14 further including phase locking each slave laser individually utilizing a phase lock loop associated with each slave laser in the plurality of slave

lasers.